

WHAT IS CLAIMED IS:

1. An emulsion polymerization process for producing a
5 fluoroelastomer comprising:
(A) charging a reactor with a quantity of an aqueous solution comprising a surfactant of the formula $F-(CF_2CF_2)_n-CH_2CH_2SO_3M$ where n is an integer from 2 to 9, or mixtures thereof, and M is a cation having a valence of 1;
10 (B) charging the reactor with a quantity of a monomer mixture to form a reaction medium, said monomer mixture comprising i) from 25 to 70 weight percent, based on total weight of the monomer mixture, of a first monomer, said first monomer selected from the group consisting of
15 vinylidene fluoride and tetrafluoroethylene, and ii) between 75 and 30 weight percent, based on total weight of the monomer mixture, of one or more additional copolymerizable monomers, different from said first monomer, wherein said additional monomer is selected from the group consisting of fluorine-containing olefins, fluorine-containing vinyl ethers,
20 hydrocarbon olefins and mixtures thereof; and
(C) polymerizing said monomers in the presence of a free radical initiator to form a fluoroelastomer dispersion while maintaining said reaction medium at a pH between 1 and 7, at a pressure between 0.5 and 10 MPa, and at a temperature between 25°C and 130°C.
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2. The emulsion polymerization process of claim 1 further comprising (D) isolating fluoroelastomer from said dispersion by addition of a coagulating agent.
- 30 3. The emulsion polymerization process of claim 2 wherein said coagulating agent is chosen so as to form a water-soluble salt with the surfactant present in the fluoroelastomer dispersion.

4. The emulsion polymerization process of claim 2 wherein said
coagulating agent is a salt having a cation selected from the group
5 consisting of Al^{3+} , Ca^{2+} , Mg^{2+} and univalent cations.

5. The emulsion polymerization process of claim 4 wherein said
coagulating agent is selected from the group consisting of aluminum
sulfate and alums.

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6. The emulsion polymerization process of claim 4 wherein said
coagulating agent is selected from the group consisting of calcium nitrate
and magnesium sulfate.

7. The emulsion polymerization process of claim 1 wherein said
surfactant is predominantly of the formula
 $\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CH}_2\text{CH}_2\text{SO}_3\text{M}$, wherein M is a cation having a
valence of 1.

8. The emulsion polymerization process of claim 1 wherein said
first monomer is vinylidene fluoride.

9. The emulsion polymerization process of claim 1 wherein said
first monomer is tetrafluoroethylene.

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10. The emulsion polymerization process of claim 1 wherein at
least one additional monomer is a fluorine-containing olefin.

11. The emulsion polymerization process of claim 10 wherein
said fluorine-containing olefin is selected from the group consisting of
vinylidene fluoride; tetrafluoroethylene; hexafluoropropylene;
1,2,3,3,3-pentafluoropropene; and chlorotrifluoroethylene.

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12. The emulsion polymerization process of claim 1 wherein at least one additional monomer is a fluorine-containing vinyl ether.

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13. The emulsion polymerization process of claim 12 wherein said fluorine-containing vinyl ether is a perfluoro(alkyl vinyl) ether.

14. The emulsion polymerization process of claim 13 wherein said perfluoro(alkyl vinyl) ether is perfluoro(methyl vinyl) ether.

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15. The emulsion polymerization process of claim 1 wherein at least one additional monomer is a hydrocarbon olefin selected from the group consisting of propylene and ethylene.

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16. The emulsion polymerization process of claim 1 wherein said monomer mixture further comprises 0.05 to 10 weight percent, based on the total weight of monomers, of a cure site monomer.

17. The emulsion polymerization process of claim 16 wherein said cure site monomer is selected from the group consisting of i) bromine-containing olefins; ii) iodine-containing olefins; iii) bromine-containing vinyl ethers; iv) iodine-containing vinyl ethers; v) fluorine-containing olefins having a nitrile group; vi) fluorine-containing vinyl ethers having a nitrile group; vii) 1,1,3,3,3-pentafluoropropene; viii) perfluoro(2-phenoxypropyl vinyl) ether; and non-conjugated dienes.

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18. The emulsion polymerization process of claim 1 wherein a chain transfer agent is added to said reaction medium during step (C).

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19. The emulsion polymerization process of claim 1 wherein said fluoroelastomer comprises copolymerized units selected from the group

- consisting of i) vinylidene fluoride and hexafluoropropylene; ii) vinylidene fluoride, hexafluoropropylene and tetrafluoroethylene; iii) vinylidene fluoride, hexafluoropropylene, tetrafluoroethylene and 4-bromo-3,3,4,4-tetrafluorobutene-1; iv) vinylidene fluoride, hexafluoropropylene, tetrafluoroethylene and 4-iodo-3,3,4,4-tetrafluorobutene-1; v) vinylidene fluoride, perfluoro(methyl vinyl) ether, tetrafluoroethylene and 4-bromo-3,3,4,4-tetrafluorobutene-1; vi) vinylidene fluoride, perfluoro(methyl vinyl) ether, tetrafluoroethylene and 4-iodo-3,3,4,4-tetrafluorobutene-1; vii) vinylidene fluoride, perfluoro(methyl vinyl) ether, tetrafluoroethylene and 1,1,3,3,3-pentafluoropropene; viii) tetrafluoroethylene, perfluoro(methyl vinyl) ether and ethylene; ix) tetrafluoroethylene, perfluoro(methyl vinyl) ether, ethylene and 4-bromo-3,3,4,4-tetrafluorobutene-1; x) tetrafluoroethylene, perfluoro(methyl vinyl) ether, ethylene and 4-iodo-3,3,4,4-tetrafluorobutene-1; xi) tetrafluoroethylene, propylene and vinylidene fluoride; xii) tetrafluoroethylene and perfluoro(methyl vinyl) ether; xiii) tetrafluoroethylene, perfluoro(methyl vinyl) ether and perfluoro(8-cyano-5-methyl-3,6-dioxo-1-octene); xiv) tetrafluoroethylene, perfluoro(methyl vinyl) ether and 4-bromo-3,3,4,4-tetrafluorobutene-1; xv) tetrafluoroethylene, perfluoro(methyl vinyl) ether and 4-iodo-3,3,4,4-tetrafluorobutene-1; and xvi) tetrafluoroethylene, perfluoro(methyl vinyl) ether and perfluoro(2-phenoxypropyl vinyl) ether.

20. The emulsion polymerization process of claim 19 wherein said fluoroelastomer further comprises end groups selected from the group consisting of bromine-containing end groups, iodine-containing end groups, and mixtures thereof.

21. A curable fluoroelastomer prepared by the process of claim 1.